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SELECTED BIBLIOGRAPHY

OF

AIR TRAFFIC CONTROL

WITHIN THE FIELD ARMY

25 February 1965

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ABSTRACT

This bibliography resulted from a selective survey of the literature on Air Traffic Control (ATC). The search was limited primarily to the problems of ATC within the Field Army and the related subjects of Communications, Navigation, Radar, Aircraft Identification Systems, Aircraft characteristics, Data and Display Systems, Approach and Landing Systems, Weapons Systems, and the requirements of Army Aviation in a Combat situation.

This bibliography contains 131 references which includes reports, papers, and periodical articles covering the period from 1961 to December 1964.

INTRODUCTION

This selected bibliography contains references pertinent to the literature on Air Traffic Control. The search was limited primarily to the problems of ATC within the Field Army with emphasis of the related areas of Computer Applications, Navigation, Approach and Landing Systems, Communications Equipment, Radar, Combat Applications, Aircraft Identification-Friend or Foe, Military Aircraft, Data and Display Systems and Weapon Systems. References are also included on other branches of Military Aviation as well as Civil Air Traffic Control, however, no attempt was made to specifically cover these fields.

For more comprehensive information on the subject of Air Traffic Control reference may be made to EM 6428, "Literature Search on Air Traffic Control and the Electronic Equipment Needs of Aviation", dated 2 February 1961, and to Abstract Cards available at the Main Technical Library which up-dates EM 6428.

Entries in this bibliography are arranged alphabetically by title within the subject catagories and their subdivisions as listed in the table of contents.

The following indexes and sources were utilized in this literature search which covers the period from 1961 to December 1964:

Autonetics Library's report subject file

Classified Scientific and Aerospace Reports Indexes (CSTAR)

Computer Abstracts of Cards

Current issues of Journals, Conference proceedings and Transactions

International Aerospace Abstract (IAA)

Pacific Aerospace Library Uniterm Index (PAL)

Rand Index 1946-1962

Scientific and Technical Aerospace Reports Indexes (STAR)

Technical Abstracts Bulletin (DDC).

The compiler acknowledges the technical assistance given by C.E. Kastenholz, Specialist, Systems Design and Integration, Data Systems Division.

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A. AIR TRAFFIC CONTROL

1. General

1. ACCEPTANCE TESTS OF AIR TRAFFIC CONTROL CENTRAL AN/GSN-7. R.C. Perle. (Bendix Radio Division, Bendix Aviation Corporation, Baltimore, Maryland, Contract AF 19(604)-1881, December 1959, 30 pp., 1 ref., AFCRC-TR-59-372) AD 235 256

Air Traffic Control Central AN/GSN-7 was found in acceptance tests to meet the engineering requirement in all respects except that the tracker azimuth dead zone is excessive. Time-to-go mean errors observed ranged from 1 percent to 0.1 percent of full scale. The range-mark generator leaves much to be desired. Quality of tracking is comparable to that of the AN/GSN-3. Other features are discussed. Representative data are tabulated.

2. AIR TRAFFIC CONTROL. W.G. Osmun and E. Herbert. (International Science and Technology, September 1963, pp. 20+)

Air traffic control seems deceptively simple because there are so many ways that parts of the problem can be isolated, defined, and solved. Each technique, seems to be the starting point for a solution to the problem of coordinating the flights of many aircraft so they stay safely separated. But engineering them into a balanced man-machine system turns out to be an elusive task. Aircraft fly higher, faster. Users of the airspace make conflicting demands. Automatic communication and information processing is the answer recommended by a host of study groups. But after decades of studies, the pilots and controllers are still linked by a patchwork quilt of navigational systems, communications, radar of various vintages, anxious eyes in the cockpit, and some nervously chewed-on pencil stubs.

3. AIR TRAFFIC CONTROL EVOLUTION. R.J. Shank. Federal Aviation Agency. (Astronautics & Aeronautics, Volume 2, Number 8, August 1964, pp. 46+)

The author discusses in detail how it is possible to modernize and improve the air traffic control systems through a series of rather orderly steps.

For purposes of analysis, the author has seen fit to visualize the over-all system of aviation or airspace utilization as consisting of 10 basic component parts. Each of these interacts on the others and none can be omitted in considering any practical system.

These 10 component parts are the aircraft, the airfield, the pilot, navigation, weather information, aeronautical information, rules and procedures, communications, controllers, and air traffic control.

4. ARMY AIRCRAFT TRAFFIC CONTROL AND NAVIGATION SYSTEM. (Army Electronic Proving Ground, Fort Huachuca, Arizona, Final Report, Report Number AEPG-SIG 950-22, 1956, UNCLASSIFIED) AD 161 102

A test and evaluation was made of the Army Aircraft Traffic Control and Navigation System for use in the Field Army employing equipments which are presently available.

Concepts, techniques, and methods for the control of air traffic were evaluated by means of system tests, and the best system to meet Army requirements was determined. Recommendations are made for the implementation of the best system and for determining improvements by means of a supplemental program of tests.

5. AIR TRAFFIC CONTROL SET AN/TSW-1 (XC-1) AND AIR TRAFFIC CONTROL SET AN/TSW-1 (XC-2). Charles J. Carson. (Craig Systems, Inc., Danvers, Mass., Contract DA 36-039-sc-66410, Final Report, June 1957-11 January 1961, 11 January 1961, 38 p.) AD-256 866

The AN/TSW-1 (XC-1) is an air traffic control tower for the control of air traffic on and around air fields and during landings and take-offs. It houses both visual and audio communications equipment. Its basic use is similar to that of a permanent airport control tower. The AN/TSW-1 (XC-2) is an air traffic control set consisting of a visual control shelter and a radar control shelter for all weather control of aircraft on and around an air field. Both facilities can be operated independent of or in conjunction with other airport facilities. The development and construction of these facilities is described. The arrangement, mounting and installation of communications and navigational equipment in the shelters is also described.

6. AUTOMATIC TELEPRINTER MESSAGE SWITCHING CENTRES. J.H. Thurmann. Siemens and Halske AG, Munich. (Interavia, Volume 19, February 1964, pp. 242-245)

The constantly growing teleprinter traffic is one of the important factors for the safe and smooth operation of air traffic.

The Dutch company KLM's system at Amsterdam Airport is however the first of these capable of automatically switching teleprinter traffic on all circuits, without any manual control.

7. AUTOMATION - A SOLUTION TO THE AIR TRAFFIC CONTROL PROBLEM? J.D. Blatt. Federal Aviation Agency, Systems Research and Development Service, Washington, D.C. (Interavia, Volume 17, December 1962, pp. 1565-1568)

Discussion of some basic problems involved in air-traffic control, in terms of recent progress in traffic-improvement plans made in the USA. Particular reference is to a design developed by the FAA for the national airspace-utilization system. This design recognizes that the air-traffic-control system is not an independent system but a subsystem that, to be effective, must interconnect with many others.

8. AUTOMATION IN AIR TRAFFIC CONTROL. W.R.R. Haines. Decca Radar, Limited, Data Handling Division, New Malden, Surrey, England. (Interavia, Volume 17, December 1962, pp. 1576-1578)

Appraisal of principles and technical features which provide a basis for the development of automatic ATC systems aimed at relieving the controller of routine tasks to afford time for decision making and planning of air-traffic flow.

9. BASIC AIR TRAFFIC CONTROL SYSTEM CONCEPTS. H.K. Morgan. Bendix Aviation Corporation, Detroit 2, Michigan. (IRE Transactions on Aeronautical and Navigational Electronics, March 1960, pp. 12-14

The basic need for air traffic control for aircraft and missiles results from the inability of any pilot or missile control agency to digest and handle information concerning many aircraft, even if presented perfectly, since judgment must be centrally controlled. Only in wholly controlled space is separation safely handled, a system necessity.

10. **CONTROL CONCEPTS OF THE AN/GSN-11 TERMINAL AIR TRAFFIC CONTROL SYSTEM.** <u>S. Moxley, Jr.</u> (IRE Transactions, Vol. ANE 8, No. 2, June 1961, p. 51-59)

The perplexing problem of today's air traffic control is one of flying faster and faster to a longer and longer waiting line. This paper discusses the control capabilities of an advanced air traffic system in being. An Air Force development first initiated to handle the fast interceptor recovery so vital to maximizing scramble range, the AN/GSN-11 Air Traffic Control Central is near the end of exhaustive simulator tests and scheduled to begin live flight evaluations in July, 1961.

Contending that air safety ultimately depends on achieving higher safe acceptance rates, GSN-11 adaptability to latest theories on queuing, separation, dual runways and others is discussed. Electronic design and hardware make-up of the GSN-11, described in the literature, is first reviewed briefly.

11. DOPPLER VOR EXTENDS USE OF OMNIRANGES. <u>J. Holahan.</u> (Space/Aeronautics, Volume 31, June 1959, pp. 118-121)

The most widely used navaid the world over is the visual VHF omnirange. Its Achilles heel has always been its vulnerability to site errors, for which many cures have been attempted. Doppler VOR is one of them—and there's strong evidence, including flight test data, that it works.

The Federal Aviation Agency (FAA) reports that in extensive lab field, and flight tests made over a two-year period by its technical Development Center, a "new," Doppler-type of VOR station has cut site errors to negligible proportions.

12. FIRST INTEGRATED A.T.C. CENTRE SET UP IN U.S.A. (Aeroplane, December 12, 1963, pp. 40+)

The first integrated military/civil air traffic control centre in the United States came into service on December 1. This new Great Falls air route traffic control centre makes full use of the Air Defense Command's SAGE facilities at Malmstrom. In doing so, it also provides radar coverage over certain areas of North Dakota which previously lacked such services for civil aircraft.

13. OPERATIONAL TEST AND EVALUATION AIR-TO-AIR TACAN. (Tactical Air Command, Langley Air Force Base, Virginia, TAC TR61 59, June 1963, 9 pp., UNCLASSIFIED) AD 408 441

A requirement exists for an accurate and simple system to indicate the distance and azimuth between aircraft engaged in station keeping. This test was conducted to determine the potential of the air-to-air TACAN Set AN/ARN-72 used in conjunction with the UHF Direction Finder AN/ARA-25 to provide this information. It was determined that this equipment could satisfy this requirement to a limited degree but it does not provide the precision positioning information required for present station keeping tactics in an all-weather environment.

14. LOCTRACS - AN ALL AIRCRAFT SURVEILLANCE SYSTEM. P.F. Pearce. (Paper presented at the National Aeronautical Meeting of the Society of Automotive Engineers, Los Angeles, California, October 10-14, 1960, Preprint Number 243B, 11 pp.)

Description of an air traffic control system in which position, identity, and altitude information are provided automatically and continuously. Each aircraft in the system carries a small pulse-coded transmitter that operates in conjunction with a ground network of receivers. Four ground stations define a sector of coverage, and the signals received at the sector's four sites are relayed by microwave links or telephone lines to a surveillance center, where information processing takes place.

15. INVESTIGATION OF DEPLOYMENT PROBLEMS AND ALIGNMENT OF THE AN/TSQ-47 EMS SYSTEM. J.J. Lauginiger, et al. United States Air Force, L.G. Hanscom Field, Bedford, Massachusetts. (Radio Corporation of America, Burlington, Massachusetts, Technical Documentary Report Number ESD-TDR-63-601, Contract No. AF 19(604)-8020, June 1963, 281 pp., UNCLASSIFIED) AD 425 143

This report concerns the analysis, evaluation and recommendations of specific solutions to problems concerned with the design of equipment for an air-transportable traffic control system (EMS). Technical characteristics, design criteria, and electrical and mechanical drawings in the following problem areas are discussed. (1) Application of the principles of modular packaging to data collection and remoting equipment for surveillance, IFF, and precision approach functions. Design of monitoring and self-checking circuits to rapidly isolate trouble to specific modules. (2) Application of redundancy to more critical circuits to insure continuation of operations in event of partial failure. (3) Simplification of critical circuits to reduce skill level and training of maintenance personnel, and (4) The delineation of "by the numbers" procedures for initial alignment of equipment at a deployed site, and for maintaining operational continuity of essential functions in event of partial failure.

16. INFORMATION SYSTEMS INTEGRATION. R.L. Kirby. (Mitre Corporation, Bedford, Massachusetts, Report number SR 93, Contract AF19 628 2390, ESD TDR63 500, April 1964, 44 pp., UNCLASSIFIED) AD 438 429

A series of diagrams depict the way automation has, historically, been introduced into existing organizations, emphasizing that automatic interchanges are the last to develop. The automation of air traffic control in the case of a flight path traversing adjacent control sectors is used as an example. The meaning of the total integration job is then developed in terms of levels of integration, hierarchical networks of systems, and organizational and functional interfaces by following down a systematic path through a series of diagrams through various levels to the 425L system. The applicability of the discussion to both business systems and command and control systems is pointed out.

17. OPERATIONAL TEST AND EVALUATION OF AIR TRAFFIC CONTROL CENTRAL AN/GSN-11. (Electronics and Ordnance Division, Avco Corporation, Cincinnati, Ohio, Contract AF 19(604)7379, ESD TDR 63-187, Report Number AE-219-63-1, 1 Volume, January 1963, UNCLASSIFIED) AD 299 074

DESCRIPTORS: *Air traffic control systems, *Ground controlled approach radar, *Airport radar systems, Analysis, Moving target indicators, Radar beacons, Radar range calibrators, Wind, Radar tracking, Position finding, All-weather aviation, Operation, Aviation safety, Flight testing, Tests, Flight speeds, Statistical data, Ground speed, Radar landing control, Airplane landings, Radar scanning.

18. POSITIVE CONTROL AREA. F.J. Burry, Jr. (Interceptor, Volume 3, March 1961, pp. 8-9)

19. PRINCIPLES AND FEATURES OF DISTANCE MEASURING EQUIPMENT (DME)-WITH RELATED PRESENTATIONS ON VORTAC, VOR/DME AND TACAN. R.I. Colin and S.H. Dodington. (ITT Federal Labs., Report Number R-63-B-05, UNCLASSIFIED)

20. REPORT OF TEST RESULTS AND CAPABILITIES OF AN/MPN-17A SYSTEM NO. 3 (U). (Gilfillan Brothers, Incorporated, Los Angeles, California, Contract AF30 635 25279, RADC TDR63 254, July 1963, 359 pp., SECRET) AD 340 313L

DESCRIPTORS: (*Air traffic control systems, Electronic counter countermeasures), (*Terminal flight facilities, Electronic counter-countermeasures), (*Electronic counter countermeasures, Landings), (*Radar landing control, Electronic counter countermeasures), Electronic countermeasures, Search radar, Landings, Training, Flight testing (U).

21. SMALL, LIGHT-WEIGHT ALTITUDE TRANSMISSION EQUIPMENT. (Hazeltine Technical Development Center, Incorporated, Indianapolis, Indiana, Final Report, Contract ARDS477, April 1963, 1 Volume, UNCLASSIFIED) AD 404 560

Both SLATE I and SLATE II operate at a transmitter frequency of 1090mc and receiver frequency of 1030mc. SLATE I reply codes include any of 33 altitude codes plus an IDENT pulse. SLATE II reply codes include any of 33 altitude codes in mode c or codes 00 through 77 (64 codes), plus the IDENT pulse in mode 3A. Both SLATE modes incorporate additional circuits to provide echo suppression and side lobe suppression.

22. SMALL LIGHT-WEIGHT ALTITUDE TRANSMISSION EQUIPMENT. (Hazeltine Corporation, Little Neck, New York, Contract ARDS-558, Report Number 10136, Final Report, April 1964, 78 pp., UNCLASSIFIED) AD 600 822

This report describes the design and development of Small, Lightweight, Altitude Transmission Equipment (SLATE III and SLATE III Mark I). The development was performed by the Hazeltine Corporation, Hazeltine Electronics Division for the Federal Aviation Agency, Systems Research and Development Service under Contract ARDS-558. SLATE III operates in the Air Traffic Control Radar Beacon System to furnish the air traffic controller with aircraft identification and altitude information. Two SLATE III and one SLATE III Mark I equipments were delivered.

23. SPECIAL NEWS REPORT: NEW IDEAS IN AIR TRAFFIC CONTROL. L.H. Young. (Control Engineering, April 1961, pp. 24+)

At its Washington Headquarters and at its Atlantic City experimental facility FAA has been pursuing its program to ease the air traffic jam. Implementation of Phase II of its program-application of existing technology to air traffic control-has now been divided into nine functions: (1) Flight plan acceptance, processing, and distribution; (2) Automatic updating of flight strips; (3) Time and altitude conflict prediction, resolution, and display; (4) Bright radar display; (5) Flow control; (6) Radar track-while-scan with tracker-driven alphanumeric data; (7) Profiles and sequencing for transition and terminal control; (8) Radar beacon interrogation; and (9) Scramble corridor and conflict prediction, resolution and display.

Most important piece of equipment in this program is a special purpose digital computer developed by Librascope Div. of General Precision to end manual air traffic paperwork.

24. STATION KEEPING. M.J. Dentino. (Autonetics, A Division of North American Aviation, Incorporated, Anaheim, California, Technical Memorandum 3445-5/RDP-1, July 1, 1963, 34 pp., UNCLASSIFIED)

This report presents a workable station keeping concept, and describes a number of techniques through which this concept can be mechanized as an integral interrogator-transponder system. Since this is a preliminary report, only the more salient problems of mechanization and expected system characteristics are discussed. Since an experimental model of the complete system described has not been tested, the validity of the operation characteristics which are discussed, is left to the reader to surmise.

25. A STUDY OF ECCM TECHNIQUES FOR FUTURE EMERGENCY MISSION SUPPORT SYSTEMS (U). N.J. Cafarelli, Jr. (Radio Corporation of America, Burlington, Massachusetts, Contract AF19 604 8859, ESD TDR63 183, January 1963, 76 pp., SECRET) AD 346 795

DESCRIPTORS: (*Electronic counter counter-measures, Research program administration), (*Air traffic control systems, Electronic countermeasures), (*Radar jamming, Air traffic control systems), Communication systems, Navigation, Search radar, Redundant components, Surface to air, Landing aids, Command and control systems, Radar antijamming, Radar navigation, Airport radar systems, Navigation aids (U).

2. Computer Applications

26. DIGITAL AIR TRAFFIC CONTROL CENTRAL (VOLSCAN). W.M. Wolf., et al. (William M. Wolf Company, Boston, Massachusetts, Final Report, Contract No. AF 19(604)-2236, Report Number AFCRL-TR-58-180, 232 pp., UNCLASSIFIED) AD 160 826

This report presents a detailed deecription of a digital computer system which is designed to perform the functione of the present analog computer system of the Air Traffic Control Central AN/GSN-3 (XD-1) (VOLSCAN). The logical design of the terminal equipment neceesary for incorporation of a digital computer into the present analog system is epecified. Detailed flow diagrams of the digital computer program to perform all of the functions of the present analog system are included.

27. THE DIGITAL COMPUTER IN AIR TRAFFIC CONTROL. R. Arnolde. Telefunken GmbH (Constance). (Interavia, Vol. 16, July 1961, pp. 1010-1012)

The electronic induetry and air traffic control authoritiee (ATC) in many countries are at preeent endeavouring persistently to increase the efficiency of ATC by the use of automatic aids. The results of the studies and development work eo far undertaken, which have in some caees involved the expenditure of vaet sume of money, can already be seen in basic agreement on eome points as to the measures to be adopted. One of the most important of these is the planned use of programme-controlled high performance digital computers at control centres.

Some of the most important problems which can be handled in an almoet ideal manner by a suitable digital computer system and the necessary preparations and tests already in progress in various quarters are discussed.

28. FORMAL ENGINEERING REPORT ON DEVELOPMENT OF A TACTICAL FIELD COMPUTER (MICROPAC) (TASKS 25B & 27B). (Radio Corporation of America, Camden 2, New Jersey, March 17, 1958, Contract DA-36-039-SC-75968, September 1964, 182 pp., UNCLASSIFIED) AD 607 139

This report details the accomplishments resulting from Task 25B, Tactical Field Computer Micromodules, and Task 27B, Tactical Field Computer Equipment, of Extension II of the Micromodule Program.

The task at hand—demonstration of the feasibility of micromodular equipment in tactical computer applications—was predicted upon the success achieved in developing a wide range of reliable micromodules and microelements during the Initial Program and Extension I thereof.

The objectives have been achieved. The Acceptance Test of Micropac Computer demonstrated complete fulfillment of all performance requirements.

29. GENERAL DESCRIPTION AND BASIC LOGIC OF THE UNIVAC FILE COMPUTER I AIR TRAFFIC CONTROL/AUTOMATIC DATA PROCESSING SYSTEM. K.W. House, et al. (Federal Aviation Agency, Atlantic City, New Jersey, Final Report, April 1962, 112 pp., 6 refs.) N63-14472

This report provides a general description and the basic logic for an air-traffic-control automatic data-processing program. This document was written without reference to a specific computer and in sufficient detail to permit a person of limited background in air-traffic control and computer programing to understand the processing methods and logic employed.

30. AN INVESTIGATION OF ANALOGUE AIDS FOR MOBILE RAPCON CONTROLLERS. T.K. Vickers and D.E. Seasor. (Hazeltine Technical Development Center, Incorporated, Indianapolis, Indiana, Final report, Contract AF 19(604)8452, AFCRL 62-152, January 1962, 185 pp., UNCLASSIFIED) AD 276 715

A design study was directed toward the introduction of simple, lightweight analogue devices to improve the operational performance of Mobile USAF Radar Approach Control (RAPCON), facilities. Special emphasis was placed upon the need for scheduling spacing, and guiding high performance aircraft returning from high priority missions. Operational requirements are outlined and designs are presented for an Approach Scheduling Control (ASCON) Computer, an Approach Spacing Computer, and a Tangential Approach Computer.

3. Data and Display Systems

31. AUTOMATION IN AIR TRAFFIC CONTROL AN EVOLUTIONARY CONCEPT. H. D. Mitchell. (Interavia, Vol. 17, July 1962, pp. 894-895)

For air traffic control, an Elliott 502 "on-line" Data Processor and Display System has been ordered by the Ministry of Aviation for the experimental investigation of the use of automation techniques. The joint planning of facilities to be provided by this tool is being undertaken in close collaboration with the Air Traffic Control Experimental Unit and the Royal Radar Establishment. Much of the FREDA concept has been stimulated by this association.

Planning for the future of automation in air traffic control has given some appreciation of the problems presently being faced, and overcome, by controllers. Discussions have taken place with air traffic control authorities in many different countries. These have confirmed the view that the need for assistance exists now, in many areas, to enable controllers to maintain their present effectiveness in handling an increasing volume of traffic.

32. CENTRAL DATA PROCESSOR OF THE AIR TRAFFIC CONTROL SYSTEM. L.L. Wolman. General Precision, Incorporated. (IRE Wescon Convention Record, Part 6, at the Western Electronic Show and Convention, Los Angeles, California, August 23-26, 1960, pp. 85-94)

The Air Traffic Control Central Data Processor is a transistorized, distributed, digital electronic data-processing and computing complex which provides high reliability, unusually thorough error detection and correction, an exceptionally efficient method of data retrieval, large volume input/output capability, and the flexibility to fit varied system applications. Real-time, on-line operation is achieved through the simultaneous use of the four subsystems.

33. DATA LINK FOR TRAFFIC CONTROL. R.F. Williamson. (Flight, Volume 79, February 24, 1961, pp. 251-253)

For some years all those concerned with air traffic control have devoted considerable effort to increasing the efficiency of the system by improving equipment, techniques and operating procedures. In the main, recent effort has been directed towards improving the techniques of acquiring data, and then applying and processing it, in order to perform automatically some of the functions of the air traffic controller. Rather less emphasis has been placed on the development of a suitable communication system, although this is nevertheless a vital part of traffic control. The communication system must be much more sophisticated and speedy if it is to meet the requirements of the automatic system into which it fits.

34. DATA PROCESSING REQUIREMENTS OF THE FAA AIR TRAFFIC CONTROL DATA PROCESSING CENTRAL. N. Pomerance. General Precision, Incorporated, Pleasantville, New York. (IRE Wescon Convention Record, Part 6, 1960, at the Western Electronic Show and Convention, Los Angeles, California, August 23-26, 1960, pp. 95-101)

Today's air traffic control system is operated primarily on a manual basis. The Air Traffic Control Data Processing Central is designed to perform the correlation, computation and display of data on which air traffic control is based. Its fundamental goals are to reduce routine controller work load, to free the controller for decision making, to provide an evolutionary system to meet the growing needs of the system, and to provide a flexible system to meet the changing requirements of air traffic control. The operational environment of the system may be divided into two regions. One environment is primarily radar and exists in the vicinity of busy terminal areas, and the other is primarily non-radar and exists over the major portion of the nation.

35. THE DECCA DATA LINK. (Decca Navigator News, November 1962, pp. 4-5)

Brief review of the function of the Decca automatic digital data link as a component of an air-traffic-control system. The air-ground data link permits the accurate display, at an air-traffic-control center, of the instantaneous position, flight level, and identity of all cooperating aircraft in any control sector. The system is designed to provide data renewal of 50 aircraft every ten seconds.

36. DIGITRAC CENSOR DATA PROCESSOR. K. Mellberg. Standard Radio and Telefon AB, Bromma, Sweden. (Electrical Communication, Volume 39, Number 4, 1964, pp. 488-494)

The digital data processor Censor (CENtral procesSOR) is a parallel purely binary machine with a random-access magnetic core memory as an internal store. It can be characterized as a multipurpose computer primarily intended for real-time data processing in control systems. Thus the machine has features that make it very fast in such applications.

37. DIGITRAC DATA LINKS. C.O. Svensson and C.J. Vedin. Standard Radio and Telefon AB, Bromma, Sweden. (Electrical Communication, Volume 39, Number 4, 1964, pp. 508-512)

In the control of air traffic, data transmission meets the frequency exacting requirements for speed and accuracy.
Data transmission equipment must work compatibly with all kinds of data sources and data consumers. Thus flexibility and adaptability are essential requirements. For this reason it is better to consider the data link as a function rather than as a specific equipment.

38. DIGITRAC DISPLAY SYSTEM FOR AIR-TRAFFIC CONTROL. PART 1—DIGITAL AZIMUTH AND SWEEP GENERATION. B. Johansson. Standard Radio and Telefon AB, Bromma, Sweden. (Electrical Communication, Volume 39, Number 4, 1964, pp. 495-498, 3 refs.)

The most frequently used way to send azimuth information from the antenna to the plan-position indicator is to use a synchro transmission system. At the receiver end a sine-cosine generator or resolver transforms data to Cartesian coordinates. Analog data processing is used. By careful synchronization of the rotary components of the system, a relatively high degree of accuracy is obtained.

39. DIGITRAC DISPLAY SYSTEM FOR AIR-TRAFFIC CONTROL. PART 2—SYMBOL GENERATION. B. Svenson and T. Hylén. Standard Radio and Telefon AB, Bromma, Sweden. (Electrical Communication, Volume 39, Number 4, 1964, pp. 499-503)

Symbols in the Digitrac system are produced by character generators. The total number of symbols required depends on the size of the system. A typical system, able to track about 100 targets simultaneously, needs three generators to produce all required symbols for the plan-position indicators and all data on the tabular displays. The workload is shared by using one generator for the raw-video indicators, one for the synthetic indicators, and the third for the tabular displays.

40. DIGITRAC DISPLAY SYSTEM FOR AIR-TRAFFIC CONTROL. PART 3—INDICATORS AND DISPLAYS. B. Svenson. Standard Radio and Telefon AB, Bromma, Sweden. (Electrical Communication, Volume 39, Number 4, 1964, pp. 504-507)

The digital plan-position indicator is housed in an octagonal casing that mounts into the operator's desk.
The indicator is assembled from chassis and printed-card subunits. These all swing out on hinges and are therefore easily accessible. Each indicator can accommodate a 12- or 16-inch (305- or 406-millimeter) cathode-ray tube. The inputs to the indicator consist of radar range sweeps, symbols, and vector lines, all converted from digital to analog form, and video signals, supplied in standard analog form. It is also possible to display information received from several radar stations as an integrated picture.

41. AN EXPERIMENTAL VIDEO TRACKING SYSTEM FOR APPLICATION IN AIR TRAFFIC CONTROL. L.F. Stinson. Federal Aviation Agency, National Aviation Facilities Experimental Center, Atlantic City, New Jersey. (IRE Transactions on Aerospace and Navigational Electronics, Volume ANE-9, Contract Number FAA, BRD-9, December 1962, pp. 200-210)

Outline of the operation and capabilities of an experimental video tracking system designed as part of a system to determine the feasibility of implementing semiautomatic control of air traffic. This system communicates directly with a general-purpose digital computer, and is capable of generating and controlling 50 analog video trackers which can operate in either a track-while-scan or rate-aided mode. The system also provides aircraft position information to the computer for mathematical calculations of aircraft position errors, and processes computer-derived information for presentation on plan position data displays for controller use.

42. GENERATION OF ARTIFICIAL ELECTRONIC DISPLAYS, WITH APPLICATION TO INTEGRATED FLIGHT INSTRUMENTATION. G.H. Balding, Kaiser Aircraft & Electronics Division, Kaiser Industries Corporation, Palo Alto, California. C. Susskind, University of California, Berkeley, California. (IRE Transactions on Aeronautical and Navigational Electronics, Volume ANE-7, Number 3, September, 1960, pp. 92-98)

Interest in complex, dynamic, artificial displays has been stimulated in recent years by the need for a single integrated display of flight information, for pilots of high-speed aircraft, that would replace the multitude of flight instruments in current use. The method described in the present paper is capable of meeting the need for such a system. In this embodiment, the display that results presents to the pilot a stylized picture of the real world that not only integrates all of the information necessary to establish the aircraft's attitude, altitude, and speed in a single display, but does so in a manner that is closely related to the pilot's picture of the real world.

43. GROUND-AIR-GROUND DATA TRANSMISSION SYSTEMS TESTS. A.J. Uryniak. (Air Force Systems Command, Griffis AFB, New York, RADC-RAU-TM-63-2, July 1963, 26 pp., 6 refs.) N63-20749

Tests were conducted to check the feasibility of an air-ground-air narrowband frequency-shift-keying data system utilizing frequency diversity and Doppler correcting techniques. Results of air-ground-air data-transmission tests were described. It can be concluded from the test results that Doppler-correcting narrowband techniques applied to frequency diversity operation in ground-air-ground data transmission is feasible, resulting in reliability and error rates equivalent to ground point-to-point systems operating within similar effective power ranges and antenna gains.

44. INVESTIGATION OF TECHNIQUES FOR DISPLAYING INFORMATION IN AN AIR TRAFFIC CONTROL CENTER. R.A. Barker. (Stavid Engineering, Incorporated, Plainfield, New Jersey, Contract AF 19(604)-2034, Final Report, AFCRC-TR-58-113, May 1958, 134 pp., 50 refs., UNCLASSIFIED) AD 146 829

The important features of a variety of dynamic display equipments and techniques pertaining to air traffic control centers are described, broken down into (1) cathode-ray tube techniques, (2) optical techniques, and (3) special techniques. These equipments and devices are briefly analyzed from the standpoint of one or more of the following possible display applications: (1) large, bright, PPI-type displays, (2) color coded displays, (3) displays imparting altitude information, (4) tabular displays, and (5) miscellanous displays. Significant advantages and disadvantages of these equipments and techniques are discussed. The equipments which most nearly fulfill, within the present state of the art, the requirements of these air traffic control display applications are indicated. Promising display techniques, some requiring further development effort, are pointed out. Certain topics for human engineering study are suggested.

45. MESSAGE AND SYNCHRONIZING TIMES ON AN/TSQ-13. P.A. Ferris. (Air Force Cambridge Research Center, Bedford, Massachusetts, January 1959, 12 pp., Report Number AFCRC TN-59-127) AD 210 215

The AN/TSQ-13 system is designed to transmit digital data along a network of operating sites. A brief analysis is presented of the problems met when any site becomes inoperative and the network sequencing system is interrupted.

46. TRANSISTORISED AND TEMPERATURE-CONTROLLED: DECCA RADAR (TDS MARK V) OFFERS NEW METHODS OF INCREASING RELIABILITY. (Interavia, Volume 17, January 1962, pp. 105-107)

The tendency in recent years for the display and data handling element of a radar system to increase in size and complexity to meet current operational requirements, both military and civil, has been marked. The amount of electronic equipment required to create an effective display and data handling system with conventional engineering techniques is very large indeed, entailing high power consumption, with severe problems of heat dissipation.

The Decca system, known as the TDS Mark V, was developed to make possible the much wider use of really efficient display systems.

47. TRENDS IN DATA PROCESSING FOR AIR TRAFFIC CONTROL. L.B. Hallman, Jr. (Directorate of Operational Support Engineering, Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, ASD TN 61-103, Report for April-July 1961, October 1961, 8 pp., UNCLASSIFIED) AD 266 732

Information is presented on the generation, storage, and acquisition of a certain class of data that may be best obtained directly from the air or aerospace vehicle and used in the control of air traffic. Suggested means of processing such data within the aerospace vehicle are described and pertinent design parameters discussed.

B. AIRCRAFT IDENTIFICATION SYSTEMS

48. AGREE RELIABILITY TESTING OF AIR TO AIR IDENTIFICATION EQUIPMENTS. J.D. Burr, Hughes Aircraft Company, Culver City, and W.L. Allen, Hughes Aircraft Company, El Segundo. (Conference Proceedings, 5th National Convention on Military Electronics, sponsored by Professional Group on Military Electronics, IRE, Shoreham Hotel, Washington, D.C., June 26-28, 1961, pp. 151-162, 3 refs.)

A request for quotation for approximately 100 Air to Air Identification Systems with an AGREE reliability requirement was received at Hughes Aircraft Company during the latter part of 1958. The AAI system consists of an inter-rogator Set AN/APX-26B and a Transponder Set AN/APX-27B manufactured by Hughes Aircraft Company, El Segundo, California.

The Interrogator set, with the radar subsystem, generates and transmits codes paired-pulse r-f energy into space to challenge unidentified airborne targets and process the Transponder return to mark or erase the radar target video as displayed on the flight command indicator.

49. AIRBORNE VEHICLE IDENTIFICATION BY ELECTRONIC FLIGHT DATA CORRELATION. L.H. Kurkjian. Hughes Aircraft Company, Fullerton, California. (7th National Convention on Military Electronics, Conference, Proceedings, sponsored by Professional Technical Group on Military Electronics, IEEE, Shoreham Hotel, Washington, D.C., September 9-11, 1963, pp. 411-415)

A primary requirement for an effective air defense complex is the positive identification of all airborne vehicles. Such identification prevents dilution of defense capability and ensures protection of friendly aircraft. The system described in this paper, the Airborne Vehicle Identification (AVID) system, can supplement existing methods and automatize some of them to provide an increased capability for positive identification.

50. DEVELOPMENT AND TESTING OF TRANSPONDER SET AN/APX-45 (XN-1,2,3,4) AND CODER-RECEIVER-TRANSMITTER KY-311A (XN-1)ASQ-19. (Stewart Warner Corporation, Chicago, Illinois, Contract NOas59 4185 and NOw63 0424, Final engineering report, 15 June 1963, 1 Volume, UNCLASSIFIED) AD 415 145L

DESCRIPTORS: (*Identification systems, Design), (*Radar beacons, Design), Airborne, Design, Transponders, Radar receivers, Radar transmitters, Tests, Tables.

51. EMS MINIATURIZATION STUDY. E.P. Farnsworth and F. Marsden. (Laboratory for Electronics, Incorporated, Boston, Massachusetts, Contract AF 19(604)8841, AFCRL 62-54, Final report, 5 July 1961-5 January 1962, Report number C-907-A, 5 January 1962, 65 pp., UNCLASSIFIED) AD 273 133

A study was made to determine which items of equipment specified for the Augmented 4-Wheels System and required in the 1965-1975 EMS System can be reduced in size by miniaturization or development effort, to provide a more compact, mobile, air transportable system in the future. Included are considerations of the economics of micro-miniaturization, over-all equipment size reduction achievable, maintenance and reliability problems, and effect on performance characteristics.

52. FINAL REPORT STUDY OF EXISTING IFF-SIF SYSTEM. T.I. Humphreys, et al. Packard-Bell Electronics Corporation, Los Angeles, California. (Packard-Bell Report number 10153, RADC-TR-57-66, Serial Number 57-1007, Contract number AF 30(602)-1538, 28 February, 1957, 43 pp., SECRET) AD 114 392

53. HAWK - IFF. A TACTICAL AIRCRAFT IDENTIFICATION SYSTEM FOR HAWK (U). (Raytheon Company, Bedford, Massachusetts, Report number BR-1376, 9 October 1961, 1 Volume, SECRET) AD 334 661

DESCRIPTORS: *Army aircraft, *Radar receivers, *Guided missiles (Surface-to-air), Signal-to-noise ration, Antennas, Power supplies, Control panels, Traveling wave tubes, Circuits, Identifictaion, Maintenance, Radar homing, Fire control systems, Continuous wave radar, Identification systems, Aircraft, Antiaircraft defense systems.

54. AN IDENTIFICATION SYSTEM FOR USE AS AN AID TO RAID DETECTION AND AIR TRAFFIC CONTROL(U). W.K. Squires. (Rand Corporation, Santa Monica, California, Report number RM-2169, May 13, 1958, 42 pp., SECRET) AD 305 561

55. INVESTIGATION OF TRANSPORTABLE SEARCH RADAR AND SIF EQUIPMENT. J. Lauginiger, et al. (Radio Corporation of America, Camden, New Jersey, Contract AF 19(604)-8020, AFCRL-62-700, DSG-62-588-114, Final Report April 4-September 30, 1962, April 4, 1962, 257 pp.) N63-14579

The purpose of the project was to investigate transportable second radar and SIF equipments for application to the purposes of the Mobile ATC/Communication Facility—more commonly known as Augmented Four Wheels. Available equipments were evaluated against a specific performance criterion, and five equipment systems were recommended as applicable to the Augmented Four Wheels program. Each of the five search-radar systems was critically evaluated against Air Traffic Control criteria for the Quick Reaction Posture requirement of the Air Force. Remote-control requirements for the search radar and other subsystems, within the Augmented Four Wheels System complex, were thoroughly investigated. Microwave link equipments were evaluated, and specific performance characteristics were defined for use in the Augmented Four Wheels System. Space and housing requirements for the search-radar subsystem were critically studied, and definitive shelter specifications were prescribed.

56. RADAR RECONNAISSANCE SYSTEM AN/APS-85 SIDE LOOKING AIRBORNE RADAR. H.H. Mottek, et al. (3rd National Convention on Military Electronics, Conference Proceedings. Washington, D.C., June 29-July 1, 1959, Sponsored by Professional Group on Military Electronics, and IRE, p. 466)

The AN/APS-85 is a side-looking X-band airborne MTI radar capable of providing data on both fixed and moving ground targets for Army area reconnaissance purpose. The radar system consists of the side-looking radar (Radar Set AN/APS- 84) and a forward looking radar (Radar Set AN/APN-109).

57. RECOGNITION, IDENTIFICATION AND DATA PROCESSING. M.J. Anderson. (Hughes Aircraft, Contract AF 19(604)-8437, Report number TM-704, AFCRL 62-170, March 1962) AD 278 566

Problems associated with the application of new sensor and data processing techniques applicable to the recognition of non-cooperative aerospace vehicles are investigated. An aerospace vehicle recognition system concept is formulated. An evaluation methodology applicable to target recognition systems is developed. The methodology takes into account the principal functions performed by recognition systems, the quality of performance, the time required to perform the functions and the cost of the system.

58. STUDY OF ANTI-JAM TECHNIQUES FOR THE MARK XII IFF SYSTEM (U). W.J. Weiss. (Packard-Bell Electronics Corporation, Los Angeles, California, Contract AF 30(602)2298, RADC TR 61-225, Final Technical Report, Report number 10600, 27 October 1961, 139 pp., 68 refs., SECRET) AD 326 308

DESCRIPTORS: (Identification systems, Radar jamming, Countermeasures, Vulnerability, Determination.) *Identification systems, Radar equipment, *Radar antijamming, Radar antennas, Coding, Effectiveness, Analysis, Synchronizers, Antennas, Electronic circuits, Tests.

59. TIE. W. D. Ettridge. (Air Traffic Control, Journal, Vol. 4, October 1961, pp. 27-31)

Discussion of the TIE (Target Identification Equipment) system proposed by Cubic Corporation, in order to provide the radar controller with a method for the positive identification of all targets which appear on his radarscope and which are in communication with him on any ATC frequency. The system is omnidirectional, and utilizes angle-measuring equipment which requires no moving antennas and which provides accurate three-dimensional position data. The operation of the system, which is based upon a phase-difference measurement, is discussed at some length.

60. TRANSPONDER SET AN/APX-19 (MINIATURIZED AN/APX-25). R.W. Stanford. (Wright Air Development Center, Com. and Nav. Lab., Wright-Patterson Air Force Base, Ohio, WADC-TR-59-449, Project Number 1981, September 1959, 25 pp., 13,refs., UNCLASSIFIED) AD 228 811

The AF need for an Identification (IFF) transponder set capable of being installed in all combatant-type aircraft led to the development of the AN/APX-19. Prototype models fulfilled all applicable spec. requirements; the set can be used in the Mark X (SIF) identification system presently used. The history, tests, and conclusions of the AN/APX-19 R & D program are summarized.

61. VIDEO DECODER KY-364/APX. (Admiral Corporation, Palo Alto, California, Contract NOw 60-0072, Final Engineering Report, 15 December 1961, 54 pp., UNCLASSIFIED) AD 270 654L

DESCRIPTORS: (*Identification systems, *Video signals, Radar signals, Coding, Airborne, Display systems, *Data processing systems, Signal generators, Delay lines, Pulse generators, Design, Flight testing.) (Radar targets, Identification, Plan position indicators, Radar tracking, Electronic circuits.)

62. WARTIME IDENTIFICATION OF AIRCRAFT IN ALLIED COMMAND EUROPE (U). N.J. Hopkins, et al. (SHAPE Air Defense Technical Center, The Hague (Netherlands), Technical Report Number TR-28, May 1962, 85 pp., 15 refs., SECRET) AD 331 525

Many possible methods of identification are analyzed and compared on the basis of their effectiveness in preventing the destruction of friendly aircraft in the airspace over NATO Europe. Repeated runs on the IBM 704 computer provided results in the form of totals of friendly and hostile aircraft shot down when the different methods are in use. Conclusions are reached regarding the most effective combination of methods for an Identification System for NATO Europe.

C. ANTI-COLLISION AND PROXIMITY WARNING

63. FEASIBILITY STUDY OF PHOTOELECTRIC ANTICOLLISION SYSTEMS. J.L. Harris. (University of California, Visibility Laboratory, San Diego, California, Contract NObs-72092, Report Number SIO 60-49, June 1960, 31 pp.) AD 247 536

Information is presented as to the upper limits on performance capability of various visible spectrum anticollision systems. It is hoped that this information can be a valuable aid in evaluating proposals for anticollision equipments which specify operation in the visible spectrum. It is believed, that a 24 hour a day pilot warning equipment could be designed and constructed. The system would use passive contrast detection with color discrimination during day light hours and a modulated light source on board each plane at night (this might possibly utilize present anticollision lamps). Information other than detection and angular location could be obtained only during night-time operation.

64. EXPERIMENTAL EVALUATION OF COMPATIBLE PWI/CAS INTERROGATOR-TRANSPONDER TECHNIQUES. VOLUME I. (Sperry Gyroscope Company, Great Neck, New York, Contract FAA ARDS444, Interim Report, September 1963, UNCLASSIFIED) AD 426 909

The results of an experimental evaluation of interrogation-transponder techniques are presented as applied to the airborne Pilot Warning Indicator (PWI) and Collision Avoidance System (CAS) problem. Both PWI and CAS are referenced because the system is designed to provide both levels of collision prevention capability on a mutually compatible basis in terms of transmitted signals.

[redacted]

D. APPROACH AND LANDING SYSTEMS

65. AN/GSN-5 AUTOMATIC LANDING SYSTEM. F.D. Powell. (Institute of Navigation, Eastern Regional Meeting, Washington, D.C., 21 April 1960, (Navigation, Volume 7, Spring 1960, pp. 48-56))

Discussion of the AN/GSN-5 closed loop system which makes possible the routine accomplishment of fully automatic precise lateral and vertical navigation of airplanes through final approach and touchdown with a minimum of new airborne electronic equipment. This system has performed successfully in a wide variety of environmental conditions. Over 3,000 automatic landings have been achieved in aircraft varying from small business airplanes and military fighters to the most modern jet transports. A variety of operational modes provide flexibility for all types of requirements, while the inherent simplicity of the system assures safety, and its adjustment capabilities minimize problems of siting. Considerations in the design of the system, system configuration and operation, special features, and flight test experience are presented.

66. ACTIVITY REPORT. (Electronic Systems Division, Air Force Systems Command, Bedford, Massachusetts, EDS-TDR-62-26, August 1962, 28 pp., UNCLASSIFIED) AD 285 276

Contents:
- Approach and landing systems
- Airport lighting systems
- Communications
- Data acquisition, processing and display
- Navigation
  - Research
- Aircraft safety
- Weather
- Support activities

67. ACTIVITY REPORT. (Electronic Systems Division, Air Force Systems Command, Bedford, Massachusetts, ESD TDR 62-28, October 1962, 38 pp., UNCLASSIFIED) AD 292 072

Contents:
- Approach and landing systems
- Airport lighting systems
- Communications
- Data acquisition, processing and display
- Navigation
- Helicopter operations
- Research
- Aircraft safety
- Weather

68. AIRBORNE APPROACH AND LANDING SYSTEM STUDY. J.W. Montooth. (Autonetics, Contract NAS2-1201, Report number EM-0363-113, Final Report, 2 August 1963, 152 pp.)

An eventual goal in the operation of piloted aircraft is to provide the capability of instrument flight under zero visibility conditions without the aid of any ground based equipment for all phases of flight. Ideally, this should encompass takeoff from one field to landing rollout to another. This task is not feasible with currently available equipment. As one step toward the solution of the problem and to provide a means for further development, this study was undertaken under the auspices of the Ames Research Center of the National Aeronautics and Space Administration.

The immediate objective is to determine what portions of the task can be accomplished in a practical manner with presently available equipment and to determine the equipment required in the immediate future to implement a system which can be used to investigate and demonstrate various means of accomplishing the desired task.

69. ALL-WEATHER SYSTEM LANDS AIRCRAFT AUTOMATICALLY AND RELIABLY. E.W. Velander. Autonetics Division, North American Aviation, Incorporated. (Society of Automotive Engineers Journal, August 1960, pp. 56-61)

Present investment in ILS equipment throughout the North American and European continents makes it unlikely that a major new system will be substituted in the next decade. Thus, the All-Weather Landing System described here is meant to meet the needs of current military and impending commercial requirements.

The All-Weather Landing Set is a complete ILS-type landing system, including initial and final approach, touchdown, and runway rollout. It provides the touchdown capability required for a manual landing or, when coupled to an automatic flight control system (AFCS), provides fully automatic approach and landing under zero ceiling and visibility conditions.

70. APPROACH AND LANDING SYSTEMS. R. Bailey, et al. (Army Signal Research and Development Agency and Lab., Fort Monmouth, New Jersey, Technical Development Plan, 1 January 1964, 66 pp., refs., N64-32585) AD 442 741

A detailed development plan, a reliability program and maintainability program, and a detailed development funding plan are presented for experimental investigation leading to the design of a landing system to be used for formation flights of all Army aircraft under tactical conditions. The system is to consist of a ground transmitter, antenna system, and power supply, and an airborne receiver and display. The ground components will be capable of being paradropped in their own transit cases. One man will be able to quickly set up and operate the equipment. The system will provide azimuth (localizer) and elevation (glide slope) guidance to at least five miles from the landing strip under all flyable conditions.

71. CATEGORY II/III TEST OF THE AN/GSN-5A. J.R. Prichard. (Rome Air Development Center, Control Systems Lab., Griffiss AFB, New York, RADC-TDR-63-166, April 1963, 33 pp.) N63-16546

The Landing Control, Central, AN/GSN-5A is a ground-based, final approach navigation system providing three basic approach and landing techniques. These include completely automatic control, cross-pointer guided approach, and talkdown. These techniques used singularly or in combination maintain aircraft surveillance and guidance information to touchdown.

72. CURRENT DEVELOPMENTS IN ALL WEATHER LANDING. PART II—THE AMERICAN SCENE. G.W. Webber. (Aircraft Engineering, March 1963, pp. 74-76)

The task of reviewing the American all weather landing scene is considerably more difficult than the corresponding task of reviewing the European scene. The most obvious reason for this is the difficulty of keeping fully up-to-date with all developments and proposals emanating from an industry which is several times as large as the corresponding British industry and 3,000—5,000 miles away. Hence the author cannot claim to have comprehensive knowledge of every development in progress and can only hope to give what he sincerely hopes is a reasonably full and balanced account of the major developments.

73. REGAL TEST PROGRAM SUPPORT. (ITT Gilfillan, Incorporated, Los Angeles, California, Final Report, March 1960-June 1963, Contract FAA/BRD-245, 22 April 1964, 108 pp., refs.) N64-21053

The engineering results of the REGAL test evaluation program conducted by the FAA are presented. The basic objective of the program was to determine the feasibility of the REGAL system, using an interferometer antenna, and to provide airborne derived elevation angle and range data capable of providing accurate guidance for landing aircraft. The latter part of the program was used to determine how well REGAL actually performed in a landing system. Over 200 completely automatic landings were achieved using four different type aircraft, all equipped with different type landing computers and autopilots.

74. STUDY OF TACTICAL ARMY AIRCRAFT LANDING SYSTEMS (TAALS). (U). E.C. Seaberg, et al. Radio Corporation of America, Burlington, Massachusetts. (U.S. Army Electronics Research and Development Laboratory, Fort Monmouth, New Jersey, Report Number 2, Second Quarterly Progress Report, 1 November 1963-31 January 1964, Contract DA-36-039-AMC-03367(E), 208 pp., UNCLASSIFIED) AD 433 631

This report presents the work effort for the period between 1 November 1963 and 31 January 1964 on the Tactical Army Aircraft Landing System (TAALS) study program. This is directed toward the establishment of all-weather landing system design requirements for future tactical Army aircraft. The program is divided into four study task areas: (1) Atmospherics; (2) Radiation and Detectability Propagation Studies; (3) Radiator and Detector Equipment Investigations; and (4) System Design Studies.

75. A TERMINAL CONTROL LANDING SYSTEM: THEORY, SYSTEM INTEGRATION CONCEPTS, AND FLIGHT TEST RESULTS. D.D. Farnum and J. W. Montooth. Autonetics, A Division of North American Aviation, Incorporated. Downey, California. (1961 SAE National Aeronautic and Space Engineering and Manufacturing Meeting, Los Angeles, California, October 1961, 36 pp.)

The need for an all-weather landing system has been steadily growing during the past few years—a need which is dictated by the increasing complexities of controlling high-performance aircraft and by a new emphasis on air safety. Government agencies and private industry here and abroad have been vigorously investigating control theory, equipment requirements, and the safety problems associated with development of a system that can make a routine procedure of all-weather landing.

This paper investigates the theory, operation, and flight-testing of the APN-114 All-Weather Automatic Landing System.

E. COMBAT APPLICATIONS

76. AIR ASSAULT DIVISION. F.F. Rathbun. (Infantry, Volume 53, September-October 1963, pp. 4-9)

It may be that history repeats itself because some things are worth repeating.

Early in 1940, a test platoon was organized at Fort Benning to find out and demonstrate how the Army could use the parachute most effectively as a combat instrument. The efforts of this group of volunteers led to the first mass jump, the first parachute battalion, and, eventually, to the birth of our airborne concept and a high-spirited soldier to make it work.

Now, a test division of men picked from throughout the Army is being organized on the same red clay hills to try out a more sophisticated concept—the air assault division. If expectations are met, our Army will have a way to get at the enemy with a soldier who is not only rugged and ready—but relatively rested.

77. AIR CONCEPTS ON A COLLISION COURSE? S. Stuart. (Air Force and Space Digest, Volume 47, August 1964, pp. 34-39)

"Although aviation offers the only feasible solution to the Army's problems of mobility in the battle area, the Army is reluctant to adopt it wholeheartedly as a substitute for conventional transportation methods." This sentence was one of the many similar ones in a stinging memorandum prepared in the Office of the Department of Defense, Comptroller, and sent to then-Secretary of the Army Elvis Stahr, Jr., on January 24, 1962.

The memorandum set off a series of events that is still in motion, most noticeably at this time at Elgin AFB, Fla., where Tactical Air Command is conducting a series of tests with an Army infantry division, and in Georgia and South Carolina, where the Army is experimenting with a radically new type of fighting unit built around helicopters used for transportation and close-in fire support.

The way the tests come out and the decisions made on them may well have a lasting influence on the Army and Air Force and the progress of unification.

78. ARMY DEMANDS NEW ELECTRONICS TECHNIQUES. Leon H. Dulberger, editor. (Electronics, 12 July 1963, pp. 20-21)

The greater area of firepower influence today requires that Army surveillance penetrate to a greater depth and have greater mobility. Evaluation of the vast amounts of data collected in many forms must be done quickly at a single location and interpreted effectively.

All of the various sensor inputs--such as radar, camera, ir, prisoner-of-war interrogations, front-line observers--must speak to evaluators in a common final language. This means the man-machine interface must be designed for quick information transference.

The new emphasis on an airborne army to provide increased mobility and quick reaction time leads to extended airborne equipment requirements for the Army. Self-contained beacon systems are needed. Communications breakthroughs and system developments are called for. Identification equipment (iff) with instant read-out is badly needed to keep pace with improved ability to down an aircraft rapidly.

To obtain high information-carrying capacity in radio communications, wide bandwidth is needed. This demands high carrier frequencies, resulting in line-of-sight limitations on propagation characteristics. Among possible solutions are elevated repeaters such as satellites, mountain-top installations, or the use of chaff.

79. BATTLEFIELD IDENTIFICATION SYSTEM STUDY (U). C.H. Vaughn. (Martin Company, Baltimore, Maryland, Contract DA-36-039-SC-90904, ER-13079, S-55115-63, Report 4, Final Progress Report, April 1-June 30, 1963, 1963, 113 pp., SECRET) X63-16241

80. BENNING UNIT TO CONTROL ARMY PLANES. (Army Times, Volume 19, April 25, 1959, p. 50)

81. DEPUTY DIRECTOR OF ARMY AVIATION ANSWERS HARDWARE QUESTIONS. R.H. Schulz. (Data, Volume 8, August 1963, pp. 15-20)

An interview with Colonel Robert H. Schulz, who discusses the role of Army Aviation and some of the problems involved in combat support and readiness.

82. EVALUATION OF THE SARAH SYSTEM (SEARCH AND RESCUE AND HOMING). G.R. Kirby, et al. (Special Air Warfare Center, Eglin AFB, Florida, SAWC-TDR-63-12, February 1964, 47 pp., refs., UNCLASSIFIED) AD 433 955

The SARAH System was evaluated to establish: (1) if it could be used to improve the Special Air Warfare capability during operations involving the location and identification of drop zones, landing zones, and personnel under adverse visibility conditions; (2) accuracy as a drop point indicator for paradrops; and (3) potential use in other Special Air Warfare applications. The evaluation included 44 actual cargo drops as well as quantitative and qualitative tests of accuracy and performance. Techniques were developed to provide an acceptable accuracy when the system is used as a drop point indicator and the beacon is located in wooded areas. In addition, a number of simulated visual releases were accomplished on an instrumented range to develop some accuracy standards against which such equipments can be judged. Employment of the SARAH System in the Republic of Vietnam is strongly recommended.

83. FOR MAXIMUM EFFORT LACAS. J.H. Reinburg. (Infantry, Volume 53, September/October 1963, pp. 24-26)

LACAS is the author's freely revised title for "Close Air Support of Ground Troops." Due to advances in aerodynamics and weapons systems, Colonel Reinburg felt that this supporting arm should have the more exact definition of "Low Altitude Close Air Support," or LACAS.)

LACAS targets are enemy personnel, equipment and installations close to friendly forces and frequently known to them. In order to achieve maximum destructive effect on the enemy without erroneously hurting friendly forces, air/ground coordination must be punctual and precise, and mandatory.

84. FOR THOSE ABOVE THE FINEST A GUIDING HAND. C.F. von Kann. (Data, Volume 9, August 1964, pp. 27-29)

In an interview with Data Magazine, Major General Clifton Ferdinand von Kann, Commander of the U.S. Army Aviation Center and Commandant of the Aviation School at Fort Rucker, discusses the role of the school in training pilots to meet the needs of air mobility of the U.S. Army. General von Kann states that much of the future tactics of Army Aviation hinges on the lessons learned in South Viet Nam, and that Army Aviation must provide significant advances in deployment and mobility to fulfill this requirement in military tactics.

85. R&D FOR ARMY AVIATION MEANS RUGGED AND DEPENDABLE. W.W. Dick, Jr. (Data, Volume 9, August 1964, pp. 19-21)

General Dick believes mobility is a key to Army superiority in any conflict and this explains his high interest in Army aviation. "I feel that if we want to take full advantage of the increase we now have in firepower, we must turn our attention to increasing mobility," Bill Dick declares. "The Army must move by air, and reconnoiter by air if it is to increase its mobility. The aircraft, both rotary and fixed wing, must become a routine transportation platform to serve in this mobility mission."

86. SKY TRAILS TO TARGETS BLAZED BY FORWARD AIR CONTROLLERS (IN VIETNAM). (Air Force Times, Volume 25, PACAF20, September 30, 1964)

87. TACTICAL EMPLOYMENT OF THE AIR ASSAULT DIVISION. H.H.Howze. (Army, Volume 14, September 1963, pp. 35-53)

In this important article, the President of the 1962 Army Mobility Requirements Board, which produced the now famous "Howze Board" report, puts the air assault division, proposed by it, under scrutiny by employing it on a tactical problem in the region of South Carolina's Great Pee Dee River.

As the 11th Air Assault Division at Fort Benning attains structure and competence it will proceed on the basis of its assigned mission, expanded presumably by its study of the Mobility Board report and undoubtedly by its own initiative, to develop the details of doctrine, tactics and technique for its employment. It will also have the chore of proving or disproving or modifying the organization prescribed by the Board.

F. COMMUNICATION EQUIPMENT AND SYSTEMS

88. AUTOMATIC GROUND/AIR/GROUND COMMUNICATIONS FOR CONTROL OF AIR TRAFFIC. W.R. Deal. Federal Aviation Agency, Washington, D.C. (1960 IRE International Convention Record, Part 8, at the IRE International Convention, New York, New York, March 21-24, 1960, pp. 124-130, 1 ref.)

Voice radio channels forming the vital links for the control of civil and military air traffic are becoming seriously congested. Studies have shown that by 1970 air traffic control communications will quadruple the 1958 volume. Automation through the use of a data link offers a practical means to relieve congestion and provides growth potential to keep pace with the rapid acceleration in communication requirements. The Federal Aviation Agency has developed the Automatic Ground/Air/Ground Communication System (AGACS) as an initial step in mechanizing routine communications. This experimental equipment is currently under evaluation at the National Aviation Facilities Experimental Center.

89. DOMESTIC AIR TRAFFIC CONTROL RADIO COMMUNICATION EQUIPMENTS. DISTRIBUTION AIRBORNE AND GROUND EQUIPMENTS, VOLUME I. (U.S. Government Research Reports, August 1959, 731 pp., $8.00) (Order from OTS), PB-171 131

90. DOMESTIC AIR TRAFFIC CONTROL RADIO COMMUNICATION EQUIPMENTS, TECHNICAL CHARACTERISTICS AIRBORNE AND GROUND EQUIPMENTS, VOLUME I. (U.S. Government Research Reports, August 1959, 411 pp.) PB 171 132

91. A HUMAN FACTORS REVIEW OF THE AN/TSQ-47 AIR TRAFFIC CONTROL/COMMUNICATIONS SYSTEM. A.C. Busch and R.B. King. United States Air Force, L.G. Hanscom Field, Bedford, Massachusetts. (HRB-Singer Incorporated, State College, Pennsylvania, Contract AF 19(628)-439, Report Number ESD-TDR-64-446, June 1964, 47 pp., UNCLASSIFIED) AD 606 629

This report is intended to provide a human factors review of the AN/TSQ-47 Air Traffic Control/Communications System. A thorough review could be done only after Category II and III testing. At the writing of this report, only Category I testing is nearing completion: therefore, much of what is reported herein is a result of data gathered during the fabrication and initial testing of the system.

92. PANEL ON MEETING PRESENT AND FUTURE DEMANDS OF GROUND-AIR-SPACE COMMUNICATIONS SYSTEMS PLANNING. ITT Communication Systems, Incorporated. (Signal, October 1963, pp. 46-56)

A panel discussion prepared to present a few thoughts from industry which would be of interest to the Military Communicators. The discussion was directed toward analysis of requirements and standards and the application of new communication techniques in media, equipment and system design to support the rapidly increasing demands of civilian and military subscribers.

93. PERFORMANCE EVALUATION OF THE NO. 300 TYPE I SWITCHING SYSTEM. L.E. Danes and L.C. Moore. (Federal Aviation Agency, Systems Research and Development Service, Atlantic City, New Jersey, Final Report, December 1962, 52 pp., UNCLASSIFIED) X63-12312

Tests were conducted at the National Aviation Facilities Experimental Center (NAFEC) to evaluate the No. 300 Switching System, Type I, developed for FAA use by the Bell Telephone Laboratories. The purpose of the development was to provide an integrated communication (interphone and radio) switching system which could be introduced into the present Air Traffic Control enrironment and added to as additional switching requirements are imposed upon the system.

94. THE ROLE OF COMMUNICATIONS IN AIR TRAFFIC SYSTEMS. D.B. Nowakoski. United States Air Force. (Signal, Volume 11, January 1957, pp. 14-16)

The air traffic system consists of a myriad of closely interlaced sub-systems, any one of which is inadequate in itself. The sub-system under discussion here is the communications network which supports the entire Air Traffic Systems structure. It is not intent of this article to revolutionize Air Traffic concepts, but to point out the urgent need for keeping pace with the state of the art involving communications.

[redacted]

G. MILITARY AIRCRAFT

95. AIR MOBILIBY NEEDS TRANSLATED INTO R&D REQUIREMENTS. J. Dibble, Jr. (Data, Volume 9, August 1964, pp. 23-25)

Chief of Air Mobility Division of OCRD answers questions on Lockheed rigid rotor, Piasecki compound, Hughes hot cycle, Hiller tip turbine and other V/STOL innovations.

96. ARMY REQUIREMENTS FOR V/STOL AIRCRAFT (U). H.H. Howze. Army Department, Washington, D.C. (In: Defense Department Report of Tri-Serv./Ind., V/STOL Symposium, (Secret Report) 1963, pp. 5-37, SECRET GP-4) X64-14644

97. KNOW YOUR ARMY FIXED-WING AIRCRAFT. (Army Information Digest, Volume 18, (Pictorial), June 1963, pp. 34-38)

98. LESSONS GAINED IN HELICOPTER AIR TRAFFIC CONTROL FROM FEDERAL AVIATION AGENCY ACTIVITIES. R.A. Fitzek. (Journal of the Royal Aeronautical Society, Volume 66, No. 620, August 1962, pp. 499-502)

There are 3 commercial scheduled helicopter airlines; New York Airways, Chicago Airways and Los Angeles Airways operations of which are conduçted in accordance with Visual Flight Rules (VFR) in Visual Meteorological Conditions (VMC) and those with Instrument Flight Rules (IFR) in Instrument Meteorological Conditions (IMC); establishment of helicopter routes and other measurements taken; examples of experience gained.

99. MILITARY USES OF THE HELICOPTER. (Helicopter and Hovercraft World, Volume 6, April 1963, pp. 95+)

Survey of the use of helicopters by the armed forces of the U.S., France, the U.K., the Soviet Union, and other European countries. A theoretical discussion of helicopter applications in combat and transportation is backed up by data of practical experience obtained in Korea, Viet Nam, and Algeria, with emphasis on guerilla warfare. The specific uses of a variety of light and heavy helicopter types are discussed, as well as the helicopter production facilities of some of the countries.

100. NEW HORIZONS FOR ARMY AVIATION. J.J. Tolson. (Data, Volume 9, August 1964, pp. 9+)

An interview with Brig. General John J. Tolson, who discusses the present status of and offers his personal predictions on Army Aviation of the future.

101. OPERATIONAL PROBLEMS OF HELICOPTERS IN THE ARMY. F.P. McCourt. U.S. Army, Transportation Research Command, Fort Eustic, Virginia. (New York Academy of Sciences, Vertical Take-Off and Landing (VTOL) Aircraft Conference, New York, New York, December 10-12, 1962, New York Academy of Sciences, Annals, Volume 107, Article 1, March 25, 1963, pp. 70-77)

Discussion of two types of environment in which the Army helicopter operates. These are (1) the operational environment, which includes the elements and factors that influence, or have a bearing on, the overall efficiency and capability of Army aviation; and (2) the induced environment, which is considered a man-machine relationship and covers some of the human-engineering aspects apparent in this relationship. In considering these areas and the problems associated with them, possible solutions being investigated are described briefly.

102. VTOL AND STOL AIRCRAFT AND HELICOPTERS AND THE SYSTEM OF AIR TRAFFIC CONTROL THEY WILL REQUIRE. J.K. B. Illingworth. (Journal of the Royal Aeronautical Society, Volume 65, June 1961, pp. 423-425)

The title of this paper is "V.T.O.L. and S.T.O.L. Aircraft and Helicopters and the System of Air Traffic Control they will require,", but it does not set out to give an audience of Air Traffic Control experts a lecture on how they will have to run their business in the future. What it does do is to make a few remarks on how the operators will wish to run these types of aircraft, when they have them, and to draw some inferences about the new problems in Air Traffic Control which will have to be solved as a result.

One point which may vitally affect the operation of all these types of aircraft is noise, but this is not discussed. Instead it will be tacitly assumed throughout the noise problems will have been overcome before the aircraft go into service.

H. NAVIGATION

103. ARMY TACTICAL AIR NAVIGATION AND TRAFFIC CONTROL. W.M. Young. (Army Aviation Digest, Volume 2, March 1956, pp. 5-8)

In any combat operation, it is the desire of the field army commander to be able to move his units rapidly in any direction, at any time, within the theater of operations and to know in advance what opposition awaits his units at a new location. Collection and evaluation of information which will reveal this opposition is the mission of battlefield surveillance, a mission in which the Army aviator plays an important role. However, the phase in which tactical air navigation and traffic control systems are most essential is the actual movement of men and materiel.

104. AUTOMATION IN AIRCRAFT NAVIGATION AND AIR TRAFFIC CONTROL. (British Communications and Electronics, Volume 10, June 1963, p. 459)

Brief description of the HARCO (Hyperbolic Area Coverage) navigation system. It consists of a small general-purpose digital computer (Omnitrac Mark II) whose basic task is to convert the normal Decca hyperbolic positional information into rectilinear coordinates to enable the Mark III Flight Log pictorial display to employ distortion free charts. In this manner the full benefits of pictorial presentation can be realized at all points of coverage. The Decca receiver is also discussed. Noted is the air-to-ground data-transmission system, known as the Decca Data Link, which is compatible with HARCO.

105. THE DECCA INTEGRATED AIRBORNE NAVIGATION SYSTEM. (Interavia, Volume 13, May 1958, p. 421)

After three years development work Decca Radar Limited has produced a Doppler radar which, combined with Decca/Dectra, provides aircraft with a complete universal navigation system, known as DIAN (Decca Integrated Airborne Navigation).

Doppler radar alone does not fully meet the requirements of air traffic control in high density traffic areas.

It is for this reason that the integration of Doppler with Decca/Dectra is of special interest.

106. FINAL ENGINEERING REPORT ON RADIO NAVIGATION AIDS IN COMMON AIR-TRAFFIC CONTROL SYSTEMS. L.A. Hartman, et al. (Airborne Instruments Laboratory, Incorporated, Mineola, New York, RADC Contract AF 30(602)-1444, Report number 3580-1, May 1957, 79 pp., UNCLASSIFIED) AD 131 200

The purpose of this study was to investigate existing and proposed navigation systems to determine their potential usefulness in the common system of air-traffic control (ATC). An important part of the project was to obtain information about navigation systems that would be available to the Air Navigation Development Board (ANDB).

107. HYPERBOLIC AREA-COVERAGE RADIO NAVIGATION SYSTEMS AS AN AID TO AIR TRAFFIC CONTROL. C. Powell. Decca Navigator Company, Limited, New Malden, Surrey, England. (Conference on Electronics Research and Development for Civil Aviation, Savoy Place, London, W.C. 2, 2-4 October 1963, Organized by the Electronics Division of the Institution of Electrical Engineers, pp. 160-162)

The hyperbolic type of navigation system, in which the position-lines are the loci of points at which there is a constant difference in the arrival-time or the phase of signals received from a pair of spaced transmitting stations, can furnish a level of position-fixing accuracy sufficient for the requirements of air navigation and air traffic control (ATC) in areas of high traffic density.

108. IMPROVED NAVIGATION AIDS NEEDED TO TIGHTEN WASTED AIRSPACE. J.F. Mason. (Electronics, Volume 35, December 14, 1962, pp. 46-48)

Discussion of various improved navigation aids and analysis to two types of all-weather landing systems. The first type uses the ground-radar-acquisition techniques, and the second utilizes pilot-derived methods. The Bell Aircraft GSN-5 is described as an example for the former. The British BLEU (Blind Landing Experimental Unit) and the American AN/APN-114 systems are presented as examples of pilot-derived systems, using airborne radio altimeters for height finding.

109. NAVIGATION AIDS IN PROTECTION OF GROUND FORCES BY FIGHTER AVIATION. Z. Guminski. Air Force Systems Command, Wright-Patterson AFB, Ohio Foreign Technology Division. (4 February 1963, 7 pp., Translated into English from Wojskowy Przeglad Lotniczy (Warsaw), Number 1, 1962, pp. 13-16) AD 298 222

Fighter aircraft that are protecting forces engaged with the enemy must act beyond the front lines; fighters assigned over enemy territory must remain there only a short time. Boundaries of transmitting the vectoring of fighters in the air from one point to another must be ascertained in advance. This paper discusses these navigation aids for fighters.

110. PICTORIAL NAVIGATION DISPLAYS AND LOW ALTITUDE NAVIGATION. R.H. Wright and T.G. Waller. (George Washington University, Washington, D.C., Contract DA-44-188-ARO-2, Consulting Report, April 1964, 13 pp.) AD 601 711, N64-30551

Described are what a pictorial navigation-display system for use in Army aviation should do, how it should look, and what tactical and training implications such a device might have. Evaluated in these terms are the ACF RT-1B, Bendix's Position Fixing Navigation System (PFNS), and Bendix Air Navigation Display System (BANDS). None of the three met all the major requirements. Potential modifications of the ACF RT-1B for Army tactical use at very low altitudes are suggested.

I. RADAR

111. THE AIR HEIGHT SURVEILLANCE RADAR AND USE OF ITS HEIGHT DATA IN A SEMI-AUTOMATIC AIR TRAFFIC CONTROL SYSTEM. T.J. Simpson. Bureau of Research and Development, Federal Aviation Agency. (1960 IRE International Convention Record, Part 8, at the IRE International Convention, New York, New York, March 21-24, 1960, pp. 113-123)

In an effort to improve the traffic handling capabilities and safety of the U.S. air traffic control system, automation of certain functions of the air traffic controller is being undertaken. In the transfer of certain responsibilities from the human to a machine, there arises the problem of maintaining within the machine the all-important relationship of aircraft position with that of aircraft identity. This paper outlines briefly the problem generated in the transition from man to machine and shows how the introduction of height is expected to relieve the particular situation. A comprehensive description of the Air Height Surveillance Radar, the source of the height data, are given.

112. DIGITRAC VIDEO CORRELATOR FOR BINARY DETECTION OF RADAR TARGETS. K. Mellberg. Standard Radio and Telefon AB, Bromma, Sweden. (Electrical Communication, Volume 39, Number 4, 1964, pp. 481-487, 4 refs.)

The growing complexity of air traffic——both civil and military—has forced air-traffic-control operators to rely more and more on automatic means to prepare surveillance information. Radar is the best means of locating airborne targets, and the plan-position indicator translates this radar information into understandable form. However, human control of air traffic based on observing displays is not sufficient today, because of the high speeds and large numbers of aircraft. Automatic equipment has to be introduced for the routine work, thus freeing the operators for special surveillance and control tasks.

113. HIGH RESOLUTION RADAR SYSTEM. G.O. Hall. University of Michigan, Willow Run Laboratories. (3rd National Convention on Military Electronics, Conference Proceedings. Washington, D.C., June 29-July 1, 1959, Sponsored by Professional Group on Military Electronics and IRE, p. 466)

The University of Michigan has developed an airborne radar system for combat surveillance which has a potential for obtaining fine azimuthal resolution at extended ranges.

The equipment is partly airborne and partly ground based. The airborne equipment consists of a side-looking coherent radar employing an antenna of conventional size. The radar output is recorded on film. A ground based processor operates on the film-stored data to produce the equivalent of a radar system with an extremely long focused antenna which increases in length with increasing radar range.

Results of flight tests are presented.

114. OPERATIONAL TEST AND EVALUATION RADAR SET, AN/TPS-22 (U). J.H. Moore. (Tactical Air Command, Langley AFB, Virginia, TAC TR62 4, October 1963, 1 Volume, SECRET) AD 344 468

DESCRIPTORS: (*Command & control systems, Search radar), (*Search radar, Early warning systems), Mobile, L band, Radomes, Inflatable structures, Air control centers, Aircraft intercept control systems, Identification systems. (U).

115. OPERATIONS MANUAL. AN/TSQ-18 RADAR SURVEILLANCE CENTRAL. (VOLUME II) (U). (Gilfillan Brothers, Incorporated, Los Angeles, California, Contract NObsr-72701, Final Engineering Report, Volume 2, 1959, CONFIDENTIAL) AD 313 698L

Notice: Only Military Offices may request from ASTIA. Others request approval of Chief, Bureau of Ships, Navy Dept., Wash. 25, D.C.

116. WHAT'S AHEAD IN ATC RADAR. (Aerospace Safety, Volume 20, February 1964, pp. 20-21)

Exactly who you are, where you are and how high you are—that's the information air traffic controllers will have on every military pilot by 1967 if the goal established by the Secretary of Defense is realized.

Programmed implementations to achieve this goal include: Installation of the new Air Traffic Control Radar Beacon System (ATCRBS/IFF) in all aircraft types being delivered in 1965, action in current production design so as to minimize retrofit, and a 20 per cent retrofit by the end of 1965.

Although the above refers to airborne retrofit goals, necessary military ground facilities retrofit requiring interrogator, decoder and display modifications are anticipated in a corollary program.

Also discussed are the Primary (Row) Radar, the Basic Mark X, the Mark X Selective Identification Feature (SIF), and their limitations.

117. TAG YOUR TARGETS! J. Rabb. Federal Aviation Agency, Data Processing Branch, Washington, D.C. (Journal of Air Traffic Control, Volume 6, November 1963, pp. 20-23)

Description of the ARTS electronic system (Advanced Radar Traffic Control System) whose initial installation is scheduled for the Atlanta Terminal area. ARTS is a radar track-while-scan system that accepts inputs from a single radar-beacon combination (ASR-4 and ATCRBI-3), tracks the video, decodes the beacon, associates alpha-numeric tags (data blocks) with selected video targets on the controller's radar displays, and automatically maintains this association.

2. Beacon

118. ALTITUDE PROCESSING IN ATCRBS. J. Freibaum. (IRE Transactions on Aerospace and Navigational Electronics, Volume ANE-8, Number 4, December 1961, pp. 149-152)

Equipment to process and display beacon-derived altitude information, being developed to enhance operational capability of Air Traffic Control Radar Beacon System, is described; beacon identity and altitude information assists air traffic controller to establish positive identification quickly and reliably; radar handoff procedures are completed more efficiently.

119. ENGINEERING EVALUATION OF AN/ARA-44 (U). V.R. Weidner. (Directorate of Operational Support, Engineering Aeronautical Systems Division, Wright-Patterson Air Force Base, Ohio, ASD TDR62 890, Final Report, Project Number 921A9057, November 1962, 114 pp., SECRET) AD 336 946L

DESCRIPTORS: *Radar beacons, Radar equipment, Simulation, Discriminators, Environmental tests, Display systems, Test methods, Reliability (U).

120. EVALUATION OF GENERAL AVIATION TRANSPONDERS. R.H. Boutillette, et al. (National Aviation Facilities Experimental Center, Atlantic City, New Jersey, Interim Report, Project Number 108-8V, November 1962, 48 pp., UNCLASSIFIED) AD 298 308

DESCRIPTORS: *Transponders, *Radar beacons, Air traffic control systems, Flight testing, Transmitter-receivers, Airborne, Ultra high frequency.

121. EVALUATION OF GENERAL AVIATION TRANSPONDERS. R.W. Delaney. (Federal Aviation Agency, Atlantic City, New Jersey, Report Number RD-64-90, Final Report, Project Number 108-030-01V, June 1964, 45 pp., UNCLASSIFIED) AD 603 864

The purpose of this project was to conduct a technical and operational evaluation of General Aviation Transponders to (1) determine extent of compliance with procurement specifications and with the performance criteria associated with the Air Traffic Control Radar Beacon System (ATCRBS) and (2) assess the performance and utility under actual operational conditions, and the benefits which might be derived from widespread implementation.

122. FAA BEACON INTERROGATION TRAFFIC CONTROL MONOPULSE RESOLUTION IMPROVEMENT AND PHASE SENSITIVE DETECTION. A. Longacre. (Syracuse University, Research Institute, New York, Contract FAA/BRD-340, Final Report, March 1963, 45 pp., 6 refs., UNCLASSIFIED) X63-15757

Monopulse Resolution Improvement has been applied to a beacon interrogation system so that azimuths of resolved aircraft may be determined with the intrinsic accuracy inherent in an azimuth-scanning pulsed radiation system for aircraft over ranges from 2 to 200 nmi from the interrogate-receive station. The fact that airborne transponders are good point sources which are not immersed in clutter permitted reliable location of the aircraft to one-fifteenth (1/15) of the beamwidth of the interrogate-receive radiation patterns, or to about 0.1°.

123. INTRODUCTION TO AUTOMATIC ALTITUDE REPORTING FOR AIR TRAFFIC CONTROL. W.T. Carnes, Aeronautical Radio, Incorporated, Washington, D.C. (IRE Transactions on Aerospace and Navigational Electronics, Volume ANE-8, Number 4, December, 1961, pp. 122-124)

This article presents a brief history on the development of Automatic Altitude Reporting via the ATC radar beacon system, (ATCRBS) and a review of current activities in the field, future operational needs, and the technical problems involved in Automatic Altitude Reporting.

124. A MATHEMATICAL ANALYSIS OF THE PERFORMANCE OF THE ATC RADAR BEACON SYSTEM. A. Ashley, F.H. Battle, Jr. Airborne Instruments Lab., Division of Cutler-Hammer, Incorporated, Deer Park, Long Island, New York. (IRE Transactions on Aeronautical and Navigational Electronics, Volume ANE-7, Number 3, September, 1960, pp. 77-83)

The Air Traffic Control Radar Beacon System is intended to provide the air traffic controller with continuous, reliable, and accurate information concerning the plan position and identity of any and/or all equipped aircraft in the airspace under his control. Like any system, however, it has practical limitations that must be recognized. The Federal Aviation Agency and the military services have sponsored a series of studies and test programs intended to reveal and measure these limitations, with a view toward optimizing their performance. This paper briefly describes the methods we have used in mathematically synthesizing system performance, and presents the major conclusions and recommendations that seem justified by the results.

125. NEW DIRECTIONS FOR AIR TRAFFIC CONTROL. Herbert Cheshire, McGraw-Hill News. (Control Engineering, Vol. 9, No. 1, January 1962, pp. 21-22)

FAA does a turnaround after Project Beacon group criticizes the Agency's special-purpose computer, flight strips, automatic communication system, and three-D radar.

126. PERFORMANCE AND REQUIREMENT ANALYSIS OF VIDEO DECODERS FOR USE WITH ATC RADAR BEACON SYSTEM. A. Ashley and L.G. Cole. (Airborne Instruments Lab., Incorporated, Deer Park, New York, Final Report, Contract FAA BRD329, January 1963, 1 Volume, UNCLASSIFIED) AD 423 278

Presented are the results of a study of the performance and requirements for decoders in the ATC Radar Beacon System. Many related topics are also presented. The study, essentially analytical, views the decoder from a functional standpoint in the performance of the overall system rather than as a piece of hardware. An extensive list of conclusions and recommendations is presented as a guide for system and component design in order that a continuously improving system may evolve.

J. WEAPON SYSTEMS

127. AIR WEAPONS CONTROL SYSTEM 412L (U). (General Electric Company, Syracuse, New York, Contract AF 30(635)10117, Monthly progress report, Report number AWCS-SM-35, October 1961, 248 pp., SECRET) AD 326 721

DESCRIPTORS: (*Aircraft intercept control systems, *Air control centers, *Ground controlled interception systems, Europe, *Antiaircraft defense systems.) (*Data processing systems, Display systems, Radar equipment, Ground support equipment, Communication equipment, Radio equipment, Design, Tests.) (Detection, Aerial targets, Tracking, Identification.) (Control systems, Guided missiles, Surface to air, Jet fighters.)

128. AIR WEAPONS CONTROL SYSTEM 412L. SYSTEM DESIGN ANALYSIS REPORT USAFE 412L. SYSTEM EMPLOYMENT DEFENSE OPERATIONS EVALUATION STUDY. VOLUME II. AWCS-MS-6 (SE-DOES) (U). (General Electric Company, Syracuse, New York, Contract AF 19(628)-513, 31 December, 1962, 32 pp., SECRET) AD 334 735

DESCRIPTORS: *Aircraft intercept control systems, *Antiaircraft defense systems, Data processing systems, Costs, Kill probabilities, Reliability, Failure (Mechanics), Ranges (Distance), Radar signals, Jet Fighters, Aerial targets, Maintenance, Maintenance personnel, Simulation, Air control centers.

129. 412L AIR WEAPONS CONTROL SYSTEM. (Automatic Control, February, 1963, pp. 98-99)

A comprehensive and automatic air control system representing a proportionate increase in U.S. defensive ability overseas were needed. The 412L system meets this need, especially during overseas tactical and "limited war" cries.

412L is used principally outside the continential United States, and transportable for air-lifting and installing anywhere in the free world where air hostilities are expected.

130. 412L AIR WEAPONS CONTROL SYSTEM. (Signal, Volume 17, November 1962, p. 46)

The Air Force and General Electric Company are testing part of a mobile air weapons control system which could be used some day by the United States in brush fire warfare in a jungle 12,000 miles away.

It will be the nation's first automated fully mobile air weapons control system, performing these tasks in areas beyond the reach of SAGE.

The purpose of system 412L is a simple one—to give the Air Force eyes, ears and a nervous system over seas. When completed and ready for operation, it will keep foreign skies under constant guard, spot, identify and evaluate flying objects in the air in seconds and tell commanders what weapons they should use to destroy these objects if they prove unfriendly.

131. JOINT TEST FORCE TEST PLAN FOR CAT II TESTS OF PHASE II 412L MOBILE SYSTEM (U). (Air Force Proving Ground Command, Eglin Air Force Base, Florida, 15 May 1962, 80 pp., CONFIDENTIAL) AD 334 393

DESCRIPTORS: *Command and control systems, *Air control centers, *Fire control centers, *Radio equipment, *Radar equipment, Identification, Command guidance, Temperature control, Flight control systems, Radar jamming, Aircraft, Power supplies, Generators, Cooling, Air conditioning equipment, Radio transmitters, Radar tracking, Air traffic control centers, Mobilization, Air force operations, Mobile, Aircraft intercept control systems, Display systems.